

position and properties, as if a comprehensive book of reference were being written.

The faults of the book are the faults of a university professor when dealing with a practical subject. As soon as works-practice is touched on, the information is not to be trusted. Thus, in the chapter on the preparation of alloys, a somewhat misleading diagram is given of a melting furnace for crucibles, and the statement is made that the maximum charge for a crucible in such a furnace scarcely exceeds 100 kilograms. To show the inexactness of this, it is enough to mention that at the Royal Mint crucibles containing more than 180 kilogrammes of standard silver have been in use for many years, and even larger crucibles are used in mints abroad.

The merits of the volume have already been sufficiently indicated. It is a pleasure to read the book. It can hardly fail to fascinate many of the students into whose hands it will come as a task, and it will be useful to those engaged in the industries as an aid in understanding the numerous articles and papers on alloys which appear in scientific periodicals every day.

T. K. R.

#### OPEN-AIR STUDIES AT HOME AND ABROAD.

- (1) *The Young Naturalist. A Guide to British Animal Life.* By W. P. Westell. Pp. xv+476. (London: Methuen and Co., 1909.) Price 6s.
- (2) *Nature.* By J. H. Crawford. Pp. x+242. (London: Swan Sonnenschein and Co., 1909.) Price 5s.
- (3) *Victorian Hill and Dale. A Series of Geological Rambles.* By Dr. T. S. Hall. Pp. x+160. (Melbourne: Thomas C. Lothian, 1909.) Price 3s.

(1) THE distinguishing feature of this survey of the British fauna is its comprehensiveness. With the exception of marine fish, there is no large order that does not come in for comment. The mammals, birds, fresh-water fish, and Lepidoptera—the most popular groups—are allotted most space, and are evidently more familiar to the author than the remainder. In spite of certain drawbacks, of which we shall have something to say, this book is a most suitable handbook for a boy or girl who is interested in animal life. The contents are arranged in ordinal fashion, and no attempt is made to deal with the associations of animals characterising field, moor, or lake, nor are there practical suggestions for the capture, maintenance, or preservation of specimens. There are, however, accounts of the habits and distinctive features of the commoner British animals that should be read with interest by young naturalists, and the wealth of clear photographs makes the book a most attractive one.

In dealing with the more familiar orders, the author's observations are evidently based on personal observation, but one can scarcely hope to extend this enviable acquaintance to all the groups, and accordingly there are occasions when the experience of others has to be drawn upon. Unfortunately, in these instances the authorities relied upon by Mr. Westell are not unimpeachable, and have been the cause of

several misstatements. Thus, on p. 456, in speaking of the severing of a limb or part of the body, the author concludes, "This is known as autonomy." We can hardly believe the author responsible for mistaking the second "t" for an "n." But in other cases the authority is clear. On pp. 291-5 there is a description of the structure and life of fish that bristles with misleading or inaccurate statements:—"the fish's gills are its lungs"; "a fish need only open its mouth and the water pours in"; "the heart has two cavities"; "the fins along the back and the stomach are especially useful in keeping the body upright"; "probably the sense of taste and touch are only very dull"; "fishes (with one or two exceptions of tropical fishes) are hatched from eggs which are laid by the parent in very large number." Why the author should have trusted to such information instead of going to first-hand authorities we do not understand. The account of the mollusca contains several mistakes. Pearls are said to be due to "a grain of sand or other hard substance. Cephalopods "have no outside shell, the principal eight-armed Cephalopod is the Argonaut or Nautilus." This confusion is rendered still more distressing by a later note (p. 439), in which the "Paper Nautilus or Argonaut" is called "Nautilus pompilius," whilst the shell of the "common Nautilus" is figured and described as a distinct structure. There is a similar confusion between the acorn barnacle and Lepas, the goose-barnacle. The nomenclature, in fact, is inconsistent. On p. 49 the Linnean system is justified, and yet throughout the book confusion is continually arising through the want of its use. What are flat burying beetles or museum beetles? What is the Noonday Fly? Even Mr. Westell seems to become confused by this absurd nomenclature, for he tells his readers to look for the "brine shrimp" in the sea; and evidently believes in some abstraction called the *real* shrimp (p. 316). But for thorough confusion of thought, take the statements that the Brittle Star "ably practises (*sic*) this remarkable habit (of fragmentation) for it casts away in regular and methodic manner certain parts of its body during its early life," or this one of the house fly, "accused often unjustly of disseminating disease, it seems that according to Sir James Crichton Browne, there is much truth in a good deal of what has been stated."

The style of the author really needs a little chastening. "Vasty deep"; "Denizens of the deep"; "I having made observations upon the insects but not them upon me" (p. 423); "despite the hue and cry which one hears so frequently as to the dense human population that this country harbours," p. 169 (as though humans were a kind of vermin), are a few expressions that should have been cut out. We know how easy is the task of picking out weak places in the work of others, and direct attention to these flaws in a very useful book in the hope that a new edition (which certainly ought to be called for) may be even better than this one. References might then be given, in the text, to the attractive illustrations. This is a very necessary, even an essential matter, for the adder, e.g., is figured on p. 20, and the de-

scription of it is not given until p. 276, where no reference to the foregoing figure occurs. The same dislocation of figures occurs in many groups.

(2) Mr. Crawford is an impressionist, and one who shares the Wordsworthian spirit. In these slight word-pictures of east-coast scenery he sketches, in a very dainty and observant fashion, the picturesque features of animal life as seen against the varying background of nature's moods. He believes, and reiterates his belief in, the value of our response to such beauty. He is an artist.

"We think in pictures. We recall in pictures. We remember more than we see. With this aid, to evolve our artistic sense were easy, to add a touch of imagination were not hard. Thus, simply, might the world be made to seem beautiful and life be filled with gladness."

These essays will perhaps not add to Mr. Crawford's reputation, but they will certainly not detract from it.

(3) This little book is mainly a reprint of articles on the geology of Melbourne and neighbourhood contributed to the *Melbourne Argus*, but also includes a survey of the strata round Port Phillip Bay and up country to Ballarat and Bendigo. The bedrock, of Silurian age, is characterised by rough, dark-barked gum-trees, and is economically of great importance for the making of pottery and bricks. The wearing down of this rock has produced the gravel beds in which the gold of the bedrock is found. These gravel beds have also their characteristic flora, the grass-trees. Intersecting these are granitic rocks which have weathered out, and support a flora of native cherries, white-barked gums, and other trees. The vast blue-stone plains have been formed by eruptions of lava emerging through the bedrock, and are distinguished by their grassy, treeless appearance. In addition there are glacial beds in many districts, and cinder beds in a few others, supporting dense forest and forming rich farm land. The descriptions are very clear, and are illustrated by good photographs.

#### ELECTROMAGNETIC THEORY.

- (1) *Anfangsgründe der Maxwellschen Theorie, verknüpft mit der Elektronentheorie.* By Franz Richards. Pp. ix+245. (Leipzig : B. G. Teubner, 1909.) Price 7 marks.
- (2) *The Theory of Electrons, and its Applications to the Phenomena of Light and Radiant Heat.* By H. A. Lorentz. Pp. iv+332. (Leipzig : B. G. Teubner; London : David Nutt and Williams and Norgate, 1909.) Price 8 marks.

(1) THE first of these volumes deals with the foundations of Maxwell's electromagnetic theory. The author is careful to point out that it is not a text-book, but a sketch based on lectures delivered to teachers. For this reason the treatment differs somewhat from what may be regarded as the normal method of presenting the subject to students; although in a branch of physics which appeals to a comparatively limited class, it may be doubted whether there are satisfactory grounds for introducing preferential treatment.

At an early stage the author shows how the two fundamental "circuitual relations" are connected by means of the principle of least-action. This is an excellent feature, and the proof would probably have produced greater impression had some definite physical picture, such as that adopted by Larmor, been introduced.

In succession, the author treats of static effects in non-conductors, of conduction, and of magnetic effects of currents. The introduction of Stokes' theorem, which is delayed until this stage, might, with advantage, have been introduced much earlier.

Induction is next discussed, and finally there is a chapter on electromagnetic waves, which closes with a brief and rather imperfect treatment of metallic reflexion.

As a whole the book is somewhat disconnected, but it ought to be judged as a collection of monographs, and from this point of view the treatment is clear and good.

(2) Lorentz' book deals with the latest development of the electromagnetic theory. It contains a series of lectures delivered in Columbia University, New York, in 1906, and will be welcomed as his latest views on a subject which owes its origin and much of its development to Lorentz himself.

There are five chapters and a section of notes, which give calculations too elaborate to be included in the text. Chapter i. treats of general principles and the doctrine of free electrons. It is to Lorentz that we owe the view that the free æther is to be regarded as at rest, and that hence phenomena in it are governed by the two "circuitual" and the two "solenoidal" equations of Maxwell.

At discrete points we may have electrical singularities characterised by a certain density. The effect of this at those points is simply to make the electric divergence equal to the density, instead of nil, and to add to the displacement current, a portion due to convection of amount equal to the product of density and velocity. At other points in the æther the effects are sufficiently included in the four fundamental equations. It is of importance to notice that this specification imposes a limitation on the internal character of an electron. Thus if an electron is defined as a shell with a surface charge of electricity, its interior must, on the basis of Lorentz' equations, consist of nothing but æther. The limitation carries important consequences, such as prescribing surface conditions.

In this chapter the author discusses the question of electric inertia on the basis of Kaufmann's experiments; but as he again takes up the question more fully in a later chapter, it will be convenient to reserve our observations.

Chapter ii. is devoted to the question of radiation and absorption of heat. Those who have followed the interesting discussion on this matter in the *Physikalische Zeitschrift* recently, will not be surprised to find that Lorentz devotes some space to the question whether the æther and the radiating body, supposed to consist of electronic radiators, can be regarded as a system to which the law of equipartition of energy can be applied. The result of such an assumption is in flat contradiction to observation. As